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CONTENTS

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CYBERNETICS, COMPUTERS AND AUTOMATION TECHNOLOGY

MISUSE OF COMPUTERS AND COMPUTER CENTERS DECRIED

Moscow SOVETSKAYA ROSSIYA in Russian 19 Aug 78 p 2

[Article by S. Abramov, professor and doctor of economic sciences, and L. Bulkin, engineer: "Computers Stand Idle"]

[Excerpts] Nowadays tens of thousands of various types of computers are used in this country. Toward the beginning of the 10th Five-Year Plan approximately 2,000 computer centers and 2,778 automated control systems have been set up and used to solve more than 300 different types of problems, including problems of production planning, accounting and control. About 10 billion rubles have been expended on setting up these facilities.

Unfortunately, in practice there occur numerous instances in which computers are almost run idle. Not infrequently the introduction of computer equipment is accompanied by an increase in the numbers of managerial personnel and a decrease in the performance indicators of enterprises. Last year experts performed a detailed analysis of the activities of 20 plants which had introduced automatic control systems. They found that in 10 of these plants the administrative staff increased in numbers and in 6 the idle time of workers increased. Other indicators also changed to the worse; this refers to the increase in overtime work as well as to the increase in expenditures per ruble of marketable output.

The causes of this phenomenon are, of course, various. But the main cause is the absence of a proper basis for the establishment of automated control systems in enterprises. In the rush to follow the fashion and introduce computers, somehow it was "forgotten" to identify the range of problems to be solved with the aid of computers. Moreover, the developers of projects for new systems were in such "haste" that they based them on inadequate technical and organizational decisions.

It is frequently observed that a numerically small team which sometimes even lacks the necessary professional training undertakes the introduction of a large and complex automated control system. After all,

cruise ships and airliners are not built in metal repair shops. An automated control system is even more complex than a cruise ship, but this is often forgotten.

Generally speaking, we have quite a few computer centers with substantial reserve capacity. It appears that in the future attention should be paid not so much to a further mechanical increase in the volume of computer facilities as to a more complete and competent utilization of the available computer pool. This requires, however, the solution of a number of organizational problems and primarily a consideration of the economic interests of both the customers and the producers.

A typical picture: Many computer centers simply are not interested in accelerating or simplifying the implementation of the orders of their customers. What matters to such centers is to operate computers as long as possible, regardless of whether or not they are operated in far from optimal regimes, since this is more profitable to their operators. After all, they bear no responsibility for the effectiveness of utilization of the "sold" computer time. And besides, the customers themselves have to pay for--true, not from their own funds--that not infrequently wasted computer time. Clearly, it is the state that ultimately is harmed by such vicious practice.

This can be avoided by introducing separate rates for the services of computer centers and rates for the rental of computer time. The relationship between these rates should be so conceived that computer operators would have an incentive for independently resolving various kinds of problems rather than hiring out their equipment to customers. Then, clearly, the creative potential of computer center operators will be more fully exploited. Then, moreover, they would be interested in reducing the order implementation time and reusing and expanding routine program libraries.

There exists one other impediment: the all-union price list for the services of computer centers has been in effect since January 1977. It was drafted by the All-Union Scientific Research Institute of Problems of Organization and Control on the instruction of the State Committee for Science and Technology. Unfortunately, the pertinent rates were established without considering the wishes of many organizations using computer facilities. The resulting rate list leads to a number of paradoxes. For example, the more modern a computer is, the less advantageous it is to use it. The established rate for an hour's rental (up to 200 rubles) of a third-generation computer reflects neither its productivity nor the class of problems being solved. This can hardly contribute to a further introduction of the highly needed advanced technology.

The high computer rental prices are a reason for the reluctance of certain enterprises, sovkhozes, kolkhozes and institutions to use the services of computer centers. Some organizations even abandon plans to introduce the automated control systems mentioned earlier. Thus the Mossel'mash Moscow Agricultural Machinery Plant of the Ministry of Tractor and Agricultural Machinery Building worked since 1975 on an automated plant control system. A total of 325,000 rubles were expended for this purpose. But this project was dropped after the plant found it could not afford the services of the Ministry's main computer center which, incidentally--such is the irony of fate--happens to be located on the grounds of that very plant. The preparations were discontinued and the money spent on setting up the control system went down the drain. Unfortunately, quite a few other similar examples could be cited. We have so many medium-capacity enterprises which are virtually deprived of the chance to exploit the achievements of vigorously developing computer engineering!

We do not doubt that the problems of a more rational utilization of computers are fully solvable. The large highly productive mathematical complexes--collective-use computer centers--are highly promising. Our task is to refine their operating principles and to enhance the effectiveness of solution of all applied problems, and primarily management problems on a mutually profitable basis. In this respect the economists, too, should make an important contribution. When developing new incentive-producing price lists it is also useful to take into account the considerable experience of the large punched card centers and calculating equipment factories.

1386
CSO: 1870

'PROGRESS' SPACECRAFT DESCRIBED

Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 7, 1978 pp 36-37

[Article by Engineer N. Novikov: "The "Progress" -- An Automatic Freighter"]

[Excerpt] The main compartments of the ship, the fuel and freight compartments, are completely new. Both of them are tightly sealed. The freight compartment has a docking unit with a hatch through which the crew of the orbital station can enter into the ship. In contrast to a "Soyuz"-type docking unit, the "Progress" has additional automatic hydraulic joints designed for the tight joining of the fuel lines of the "Progress" and "Salyut" in the docking process. The freight compartment with a volume of 6.6 cubic meters is equipped with racks for dry freight in packaging and containers. It could deliver into orbit up to 1,300 kg of different freight -- instruments, scientific apparatus, boxes of food and containers of water, as well as replacement parts for the life support system. The system for attachment of the freight ensures retention of the necessary centering of the ship and makes it possible to free any container rapidly during unloading. Here use is made of rapidly openable locks and special bolts, which free the cargo with turning of the head by only a quarter-turn. Normal atmospheric pressure is maintained in the compartment and the required temperature (from +3 to +30°C) is also maintained.

Situated on the outer surface of the freight compartment are the antennas of the radioelectronic approach system, scanning cameras (of which one looks forward at the station and the other looks at the earth), one of three light indicators by which the station crew judges the correctness of the relative positioning of the vehicles during docking (the other two are situated on the fuel compartment). Also situated on the outside are the fuel and oxidizer lines from the fuel compartment of the ship to the hydraulic joints of the docking mechanism.

But nevertheless the main concern of the designers was the fuel compartment. Whereas the operations for the delivery of dry freight did not represent anything essentially new, the pumping of fuel from one vehicle to another in orbit constituted a completely new problem. Here it was necessary to ensure a reliable sealing of the hydraulic connections between the ship and the station, and also to develop a technology for the transporting of fuel

components through combined lines, precluding the entry of gas inclusions into the "Salyut" engine; provision had to be made for automatic remote control of all operations due to the high aggressivity and toxicity of the fuel, monitoring the refueling process and much else.

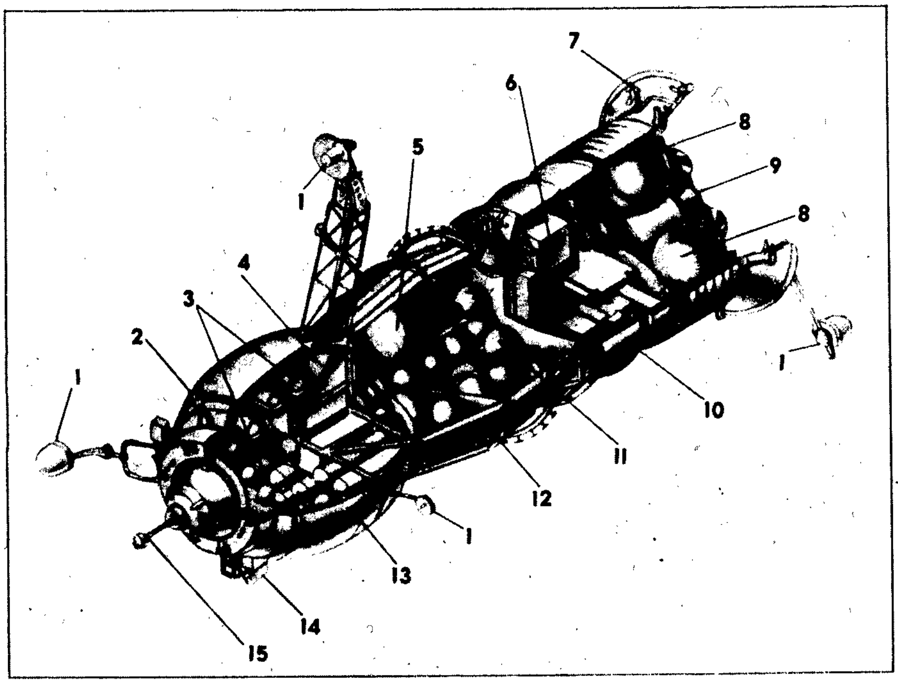

Fig. 1. The "Progress" freight transport ship

Key:

1. Antenna for the approach and docking system
2. Light indicator
3. Cargo containers
4. Cargo fasteners within the compartment
5. Fuel tanks
6. Auxiliary on-board systems
7. Orientation engines
8. Fuel tank of the ship's propulsion system
9. Main propulsion system
10. Instrumentation and equipment compartment
11. High-pressure gas tanks
12. Fuel compartment
13. Cargo compartment
14. Scanning camera
15. Active docking assembly

With respect to design, the compartment is in the form of two truncated cones which are connected to one another by their large bases. On special frames within the compartment there are spherical tanks on special frames; these are for the fuel components. Two of these have fuel and two have oxidizer, with a total mass of about 1,000 kg. There are gas cylinders with nitrogen (or air), used for expulsion of the fuel components during the pumping process, and also for replenishing the expended air reserves on the station.

Provision is made for the monitoring of temperature and pressure in the fuel tanks and in the gas cylinders in the process of storage and refueling, the tightness of the connected lines, and also the scavenging of the lines prior to the undocking of the vehicles. Control of station refueling is accomplished using a command radio link with the earth or the station's crew using a special control panel and a mnemonic system situated in the neighborhood of the station's central post.

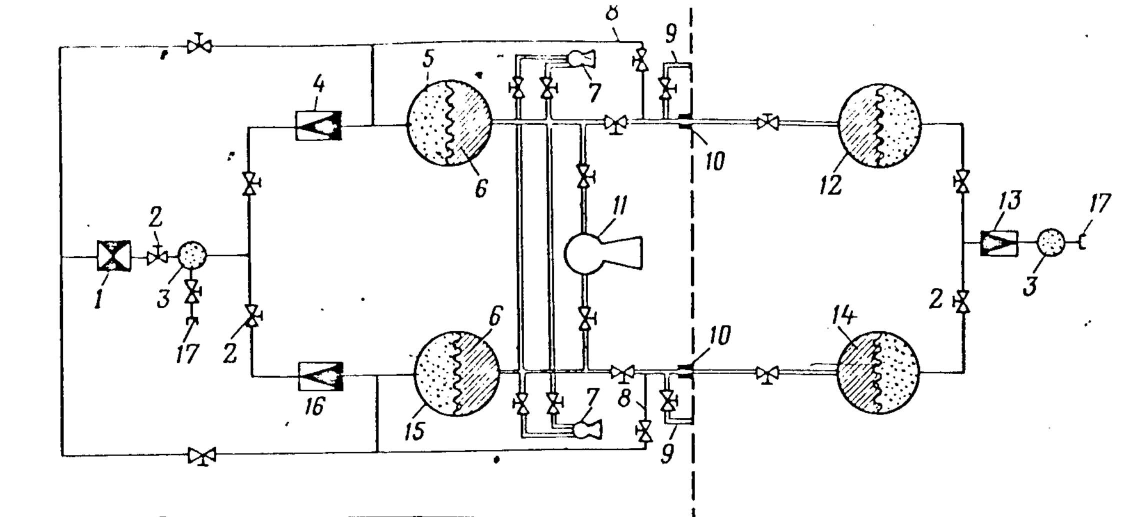

Fig. 2. Block diagram of the orbital station refueling process

Key:

1. Compressor
2. Stop valve (valve, vent)
3. Spherical high pressure tank of the fuel component expulsion system
4. Fuel tank repressurization line regulator
5. Fuel tank (on the station)
6. Elastic diaphragm (bellows)
7. Low thrust engine
8. Scavenging line for the consolidated fuel line
9. Evacuation line for the consolidated fuel line
10. Hydraulic connector sealing assembly
11. Main propulsion system
12. Fuel tank (on the transport ship)
13. Fuel tank repressurization line regulator
14. Oxidizer tank (on the transport ship)
15. Oxidizer tank (on the station)
16. Oxidizer tank repressurization line regulator
17. Connector (or nozzle) for refueling the spherical high pressure tank

The operation for the pumping of components requires preparation not only of the "Progress" refueling system, but also the "Salyut" fuel system. Figure 2 is a simplified refueling diagram. The system for fuel delivery into the

"Salyut-6" engine is of the expulsion type. This means that the fuel from the tanks is driven into the line by compressed gas at a high pressure. And in order for the fluid and gas not to mix, the tank is divided into liquid and gas cavities by a corrosion-resistant elastic membrane (sylphon). During fueling on the earth this membrane is forced by fuel pressure toward the opposite wall of the tank and the fluid thus fills the entire tank. In its gas cavity there is a fitting through which compressed nitrogen is fed from spherical high-pressure cylinders (about 200 atmospheres) through a reducer. Acting on the flexible membrane, the nitrogen is precisely the source of the energy ensuring the entry of the components into the combustion chamber.

Thus, in the gas cavities of the "Salyut" tanks there is always a pressure (of about 20 atmospheres) which does not make it possible to proceed immediately to the pumping of components from the fuel compartment of the "Progress." In order to eliminate such a countereffect the designers placed on the station a rather solid (by space standards, naturally) compressor with a 1-kW motor. The nitrogen from the "Salyut" fuel tanks is pumped by this compressor and is returned to the spherical cylinders. And since the compressor is supplied current from a buffer battery, requiring periodic recharging from the solar cells, the process of preparation for refueling occupies a considerable time.

The actual pumping of the fuel components lasts far less time. For this it is sufficient to open the necessary valves on the combined fuel line (fuel or oxidizer) and feed compressed nitrogen into the "Progress" tanks (for the most part similar to the "Salyut" tanks). Then the refueling ends by the elimination (by scavenging, a vacuum process) of the fuel component from the lines in order to prevent the entry of an aggressive fluid into the ship or station during undocking.

5303
CSO: 1870

'SALYUT-6' EXPERIMENTS DESCRIBED

Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 7, 1978 pp 38-39

[Article by Candidate of Technical Sciences I. Barmin and Engineer A. Yegorov: "New Developments in Space Technology"]

[Text] A series of technological experiments was carried out aboard the "Salyut-6" orbital scientific station. They were carried out using the "Splav-01" universal experimental apparatus (Fig. 1), delivered to the station by the "Progress-1" freighter. Yu. Romanenko and G. Grechko assembled it and installed it in the lock, whereas the control panel was installed in the working compartment. The control panel cables were connected to a heating chamber, to the on-board electricity supply network and the system for the transmission of telemetric information.

The "Splav-01" apparatus is designed for obtaining, under orbital flight conditions, various materials whose production technology requires high-temperature heating (up to 1,000°C). These are alloys of metals, composite materials, crystals of semiconductors cultivated by the methods of volumetric and directed crystallization from the fluid and vapor phases and different kinds of glass.

On 15 February the cosmonauts used this apparatus for carrying out the first technological experiment. In order to ensure the optimum experimental conditions the crew carried out complex operations for orientation and stabilization and reduced the angular velocities to thousandths of a degree per second. The stage of crystallization of the sample transpired while the crew slept in order to preclude oscillations of the station as a result of movement of the cosmonauts through it.

The experiment began with loading of the electric heating chamber, in which the cosmonauts placed a cylindrical capsule (Fig. 2), in which they placed three quartz ampules with different substances. The working cavity of the chamber was closed by a special lock.

The apparatus ensures the creation of three temperature zones in the working cavity. In two zones, "hot" and "cold," there is a regime close to isothermic. Here a process of volumetric crystallization can occur when during cooling

the entire volume of the melt is crystallized. A temperature drop is created in the third zone. As a result, during the cooling of the apparatus the crystal grows from the cold to the hot end of the ampule. Thus, during one working cycle of the apparatus it can be said that there are three independent experiments with three different substances.

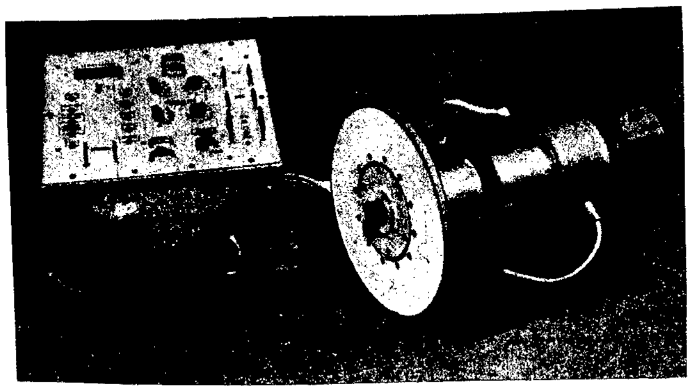

Fig. 1. Universal experimental apparatus "Splav-01": control panel and electric heating chamber.

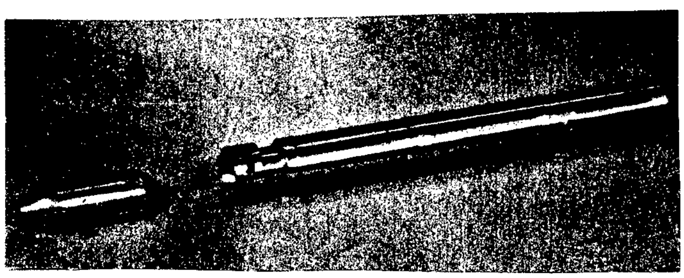

Fig. 2. Capsule inserted into electric heating chamber and ampule with the initial substance.

After loading of the apparatus the cosmonauts battened down the inner hatch of the locking compartment and opened the outer hatch. A vacuum was formed in the lock. At the same time the electric heating chamber was turned by 180° by a special mechanism so that its thermal source was oriented into space. Such a design made it possible to avoid the discharge of heat by the apparatus into the station atmosphere and at the same time ensure the effectiveness of the shielding-vacuum insulation. As a result, the heat losses and the consumption of electric current were minimal during the course of the experiments.

Upon completing the preliminary operations, the cosmonauts fixed the experimental program on the control panel -- heating temperature, time this temperature was maintained, rate of cooling, ensuring the process of hardening and crystallization, and also the temperature at which the process of regulated cooling is completed and the heater is switched off. Then, pressing the "On" button, the apparatus is switched on in an automatic operating regime.

In the course of the experiment there is provision for the continuous measurement of temperatures in the heating zone and its working parameters are monitored. This information is fed to the control panel and also through telemetric channels to apparatus at the ground flight control center.

The "Splav-01" was used in carrying out experiments with the crystallization of an intermetallic (chemical) compound of aluminum with magnesium, compounds of copper with indium, tungsten with aluminum, molybdenum with gallium. Their purpose is a study of the peculiarities of phase formation and interaction of molten and solid metals under microgravitational conditions.

In order to investigate the processes of cultivation of monocrystals and the specific characteristics of mass transfer there was directed crystallization of the semiconductor materials: indium antimonides containing microadditives of alloying components and solid solutions of cadmium and mercury tellurides.

Specialists anticipate that as a result of the experiments carried out it will be possible to obtain crystals with a more perfect structure in comparison with those cultivated on the earth.

The program for the technological experiments and the method for carrying them out were prepared by scientists of the Institute of Metallurgy imeni A. A. Baykov USSR Academy of Sciences jointly with specialists of other scientific research organizations and institutes in the country.

During the presence of the international crew aboard the station the cosmonauts carried out technological experiments prepared by Czechoslovakian and Soviet scientists. Their purpose was an investigation of the laws of hardening of melts of crystalline materials under weightlessness conditions and a determination of the possibility of producing crystals in orbit having practical importance for science and technology.

A. Gubarev and V. Remek delivered to the "Salyut-6" a capsule fabricated at the Solid State Physics Institute of the Czechoslovakian Academy of Sciences. It contained two ampules filled with samples of electrooptical materials: silver and lead chlorides and univalent copper and lead chlorides. The capsule was placed in the heating chamber of the "Splav-01" apparatus.

After completion of the experiment A. Gubarev and V. Remek packed the capsule and delivered it to earth. The scientists are carrying out thorough investigations of space samples and comparing them with crystals cultivated under terrestrial conditions.

In creating the "Splav-01" apparatus there was successful solution of complex engineering problems associated with the selection of construction materials and coverings which will be exposed to the combined effect of spaceflight conditions and high temperatures. The necessary accuracy in maintaining the parameters of the working process was ensured.

The experiments carried out aboard the "Salyut-6" station have begun the next stage in the complex research program in the field of space technology, providing for the use of manned space stations, ships and automatic probes. The

theoretical premises for space technology and the mathematical models of physical processes on which they are based are in need of thorough experimental checking under real orbital flight conditions. In the next few years a new branch of physics which could arbitrarily be called the physics of weightlessness should be developed. It will become the theoretical basis of space technology.

The final objective of the technological experiments carried out now is the organization in space of the production of materials whose obtaining under terrestrial conditions is impossible or extremely complex as a result of the effect of gravity and the physical phenomena associated with it, such as thermal convection in fluids, stratification of mixtures due to the different specific gravities of the components and others.

The principal task in the present stage in research is the accumulation of knowledge concerning the specifics of the course of technological processes, on the behavior of substances under microgravitation conditions, and testing the design of technological equipment.

Specialists lay great hopes for the appearance of new possibilities in the development of electronics, optics, lasers, precise machine building and medicine on the organization of space production.

Space technology is still taking only its first steps. But the years will pass and industrial complexes will operate in circumterrestrial orbits. Space production will become the same reality as manned spaceflights have now become.

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Riddles of a Stationary Orbit

The mastery of a stationary orbit is a major attainment in cosmonautics. Different communications satellites have now been put into such an orbit. Stationary satellites for the observer situated on the earth seem to be fixed in position and therefore with their use as relay satellites there is assurance of a constant zone of radio communication.

However, strange phenomena are noted in this orbit: sometimes there is spontaneous change in the state of the logical circuit of the satellite and there is an unexpected failure in the system for guidance of the antennas or without apparent reasons there is a change in the working temperature of the instrumentation, or what is still worse, the current source malfunctions. Many other mysterious irregularities have been recorded by American specialists in operating their satellites.

What is the reason for these strange phenomena?

It has been noted that the appearance of some of these with time are associated with geomagnetic activity. However, for others such a dependence has not been noted. Scientists have postulated that the reason for the malfunctions and irregularities is an electrical discharge caused by the accumulation of static electricity on the satellites.

But where does the static electricity come from in orbit? It appears that the principal role here is played by photoelectronic emission, as a result of which an electrostatic potential of the satellite arises. This can amount to hundreds and thousands of volts.

Another mechanism for the generation of an electrostatic charge may be the penetration of electrons with an energy of 1-40 keV into the material of the satellite and their accumulation under the surface of the insulation. These electrons draw ions from the surrounding plasma and over the surface of the insulation a charge of the opposite sign is formed, separated from the first by only a thin layer of insulation. When the potential difference exceeds the electric strength of the material a discharge occurs.

In order to check these hypotheses American specialists in January 1979 are planning the launching of a special research satellite. Using its instruments they hope to study the mechanism of appearance of charges, the reaction of satellite instrumentation to them and also to evaluate some methods for preventing charge accumulation.

Under the Solar Sail

Experience shows that light pressure causes a perturbation of artificial earth satellite orbits. This is particularly noticeable in the case of light satellites (balloons) of the "Echo" type. The magnitude of the perturbations caused by the light pressure is dependent on the ratio of the illuminated surface of the vehicle and its mass. For the "Echo-1" satellite (inflated plastic sphere with a diameter of 30 m and a mass of 68 kg) this value is 100 cm^2/g.

Scientists propose to use such a surprising property of light in order to create a solar sail, one of the possible engines for interplanetary flight-vehicles of the future. In a number of projects a solar sail is an opaque metallized polymer film with a great area which in flight is spread at a right angle to the sun's rays. The thrust of such a sail decreases inversely proportionally to the square of the distance from the sun. Moving in an elliptical trajectory, the vehicle can reach Mars. In order to reduce the flight time, the sail can be set at an angle to solar radiation in such a way that the rays will drive it from behind.

But is it possible to force the vehicle to move away from Mars in the direction of the inner planets, such as toward the earth? It was found that this is possible. For this purpose the sail must be set in such a way that the

light pressure brakes the flight of the vehicle. In such a case the vehicle with a solar sail can also be used for returning samples of Martian soil to the earth.

The journal AVIATION WEEK reports on a project for an engine of the solar gyroscope type. It consists of 12 blades each with a length of 7.4 km and a width of 8 m. The mass of each blade is about 200 kg. It is assumed that such a solar sail can impart to the space vehicle a velocity of up to 55 km/sec. The thrust at a distance of 1 a.u. (about 149.6 million kilometers) will be 500 gauss.

Gamma Lasers

Not much more than 10 years ago the term laser was understood only by specialists. Today the laser has come into extensive use in industry, medicine, cosmonautics. But scientists are thinking how they can replace the light in the laser by x- and gamma-rays. In short, they are talking about a "raser" and a "gaser." That will be the designation for x-ray and gamma-ray lasers. For the time being many difficulties still lie in the way of practical realization of the raser. Scientists feel that the production of a gaser is more realistic and they predict a broad field of its applicability. This is due, in particular, to the general property of all-penetrating short-wave radiation of a gamma laser. For example, the length of its wave does not exceed 10^{-8} cm and is commensurable with the interatomic distances in the crystal lattice.

In modern production we cannot reconcile ourselves to the fact that an analysis of the composition of matter sometimes lasts longer than the technological process of its production. The use of a gamma laser will make it possible to solve the problem, and also rapidly and without destruction carry out an investigation of "living" objects -- protein molecules.

Specialists who study the atomic and magnetic structure of matter are receiving into their hands a tool of which they have long dreamed. Evidently, the day is not far off when a researcher will place a crystal in an instrument and will receive a finished model of its structure from an electronic computer printout device.

Another characteristic of the new lasers is their great power. It is considerably greater than that of modern x-ray apparatus. For example, the power of a gamma laser obtained from one cubic centimeter of working medium can attain billions of watts. Therefore, one of the possible applications of the new laser can be gamma-resonance holography. A gamma-hologram, illuminated by a laser ray, makes it possible to obtain a three-dimensional image even of such small objects as a molecule.

A gamma laser is useful for the ranging of celestial bodies. Its ray can be directed into an inaccessible part of any mechanism, such as an aircraft engine and on a screen obtain an image of the structure or its photograph.

A high-power gamma laser can be used for breaking the molecular bonds and creating new materials, the transfer of information and even energy from space atomic stations of the future. A ray of such a laser can be a source of energy for a space ship. The foreign press tells about a project for a spaceship into whose sail the ray of a gamma laser is directed.

5303
CSO : 1870

RESEARCH TASKS IN THE SPACE LABORATORY

East Berlin NEUES DEUTSCHLAND in German 28 Aug 78 p 4

[Article by Dr Wolfgang Spickermann]

[Text] Medical experiments are a constant component in the program of manned space undertakings. The first manned space flights in the history of mankind were made possible through the work of many years by Soviet scientists in the field of space medicine. The research results obtained since that time make it possible for cosmonauts to spend several months onboard Salyut stations under conditions of zero gravity, within a confined space, and far from family and friends, and to do highly effective work without danger to their health.

Questions of productivity as well as of medical-psychological reaction of man to the working conditions in space belong today to the main line of research in the field of space medicine. For many years now there has been a close cooperation between scientists of the GDR and the USSR in this field. This created the preconditions for the current GDR participation in six joint medical experiments in the universe, of which the experiments "taste" and "leisure time" have also been carried on by former crews of the Salyut 6 station. Scientists of the institute for aero medicine at Königsbrück jointly prepared the space research with the academy of sciences of the GDR and with enterprises of our country.

For example, the question of whether and in what manner zero gravity and steady work noise in the orbiting station change the hearing threshold of the cosmonaut is of great interest. Space travelers have reported that during the accommodation phase, certain noises are perceived as much stronger than on earth. The set of these problems is tackled by the intercosmonauts in their "audio" experiment, for which hearing threshold measurements are made at certain times.

For this purpose, the portable "Elbe" audiometer was developed by the VEB Präcitronic at Dresden, and it weighs only 2 kg. This device, which measures the hearing in the frequency range from 500 to 6,000 hertz and which was developed expressly for the heavy demands of a space flight, is the basis of a novel device generation of screening audiometers whose mass production is being prepared for in Dresden.

The "Elbe" Audiometer Tests Hearing in Space

To carry out the research in orbit, the cosmonaut dons the special headset of the "Elbe" device. The second member of the international crew gradually increases the test tone and records the sound strength on a record card at the point where the ear detects the sound. Various frequency tones--separate for the right and left ears--are used for this purpose. The record cards, which bear name, date, and clock time, are returned with the cosmonaut to the earth where they are evaluated together with earth-based comparison measurements.

At the same time, explains the principal investigator of this experiment, LtCol/Dr Werner Pröhl, during a visit to the institute for aero medicine at Königsbrück, measurements are made of the absolute value of instantaneous noise at the test station, in order to record disturbing influences.

For this portion of the "audio" experiments, the cosmonauts use a precision impulse sound level meter mass-produced at the VEB RFT [expansion unknown] measurement electronics "Otto Schön" at Dresden. The device has a mass of 3.5 kg and dimensions which are the smallest for its kind in the world. It was especially adapted for use in space. The intercosmonauts use this device to determine the frequency composition of the work noise in the space laboratory and to record the sound level. These measurements also contribute to the improvement of working conditions for cosmonauts in space stations.

The use of the space device represents the carrying on of established traditions by the measurement electronics workers at Dresden. Fifty years ago, measurement devices for measuring sound strength were developed in Dresden for the first time in the entire world. The measurement unit "phon" is still used today, and was defined by Prof Barkhausen, a researcher at Dresden. During the beginning of the '60's, basic research at the technical university led to a development that made possible the recording of brief sound impulses in a manner that was correct from the point of view of hearing. These results were standardized in 1964 and in the same year made possible the construction of the first impulse sound level meter in the world.

Proven methods for space psychology are being used for the experiments "questioning" and "speech," for which the aero medics from Königsbrück take joint credit with Soviet experts. The "speech" experiment continues Soviet researches begun in 1964 on the flight of Aleksey Leonov on board Voskhod 2. It is based on the fact that human speech not only conveys subjective information but emotional feelings as well. This fact has been used for a long time by psychodiagnosticians, for example.

Space application of this technique made it possible to arrive by means of speech analysis at objective conclusions about the demand placed on cosmonauts, which conclusions are otherwise only obtainable with the aid of EKGs, EEGs, or other procedures for which it is necessary to attach a large number of sensors to the cosmonaut's body. During the flight of Aleksey Leonov on

the Voskhod 2, such speech analyses were carried out at various phases of flight and showed that the highest demands were made shortly before exit into space.

Speech Analyses Lead to Interesting Discoveries

For the "speech" experiment, the spoken messages of the cosmonauts were recorded at the flight control center and afterward evaluated at the Königsbrück laboratory for their quantative and qualitative frequency composition. The results of these researches are of interest to suitability studies not only in air and space-flight medicine but other fields as well.

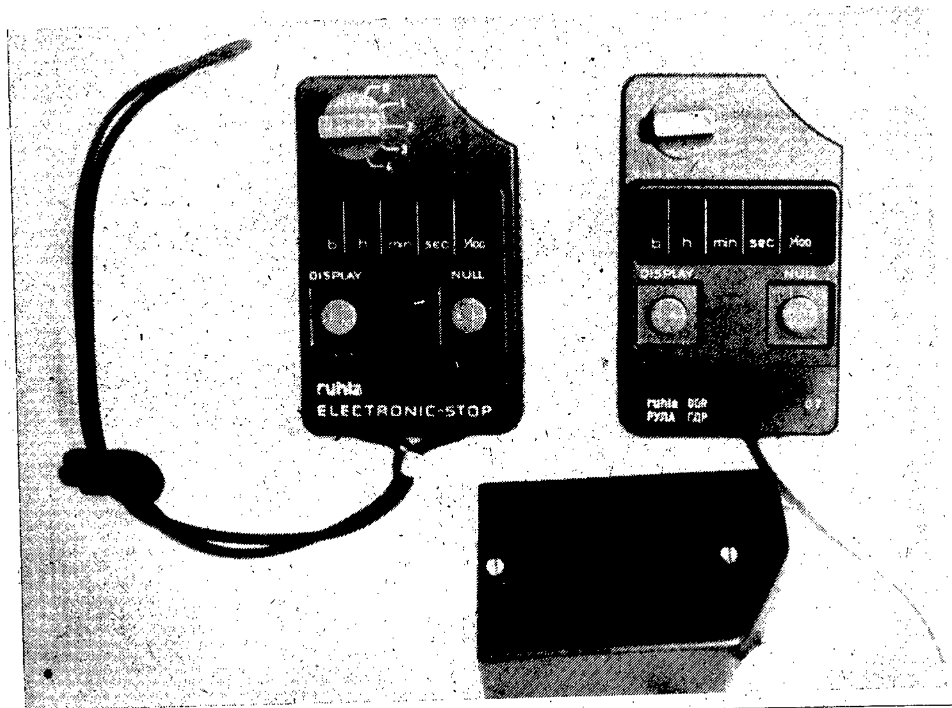
For the "questioning" experiment, the scientists of our country also reach back for the experiences of Soviet space medicine. At various times during the course of flight, the cosmonauts answered a whole complex of questions about the strain they subjectively experienced. A questionnaire jointly developed by experts from the USSR and Poland was further expanded for the GDR cosmonaut to include questions originally developed by work psychologists at the technical university at Dresden for employees in control and monitoring activities. Questions on tiring, on the appearance of monotony, and on emotional exhaustion as well as on the experiencing of stress were answered in writing by the test subjects on various days at the beginning and the end of a flight shift. The evaluation was carried out afterwards on the ground by using a system of scales.

A further medical-psychological experiment during the joint space flight explores the reaction behavior and time awareness of man under conditions in space. The test device used by the cosmonauts is a hand-held electronic stopwatch produced by the VEB clockworks at Ruhla, which is a member of the microelectronics combine. The quartz-controlled clock indicates hundredths of seconds, minutes, and hours up to days and can also be switched by external transducers. For space application, this clock was additionally equipped with appropriate synchronization.

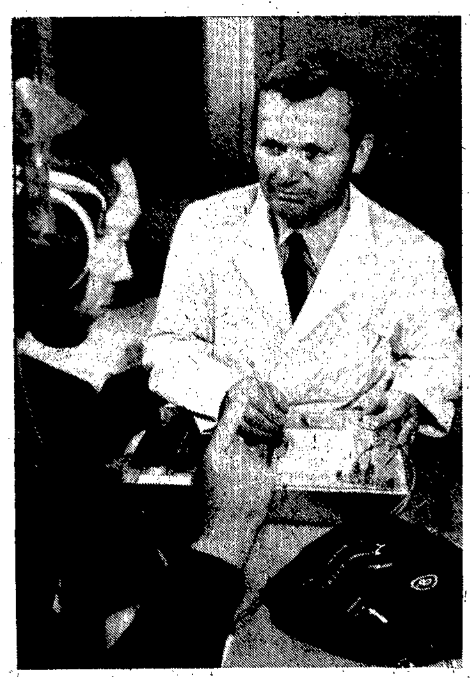
How Quickly Does a "Worker" React in Orbit?

The "time" experiment included three subexperiment variants, which the cosmonauts performed at 1000 hours and at 2100 hours. During the first series, the test concerned reaction time. A red-light-emitting diode was turned on by the clock. The person being tested released the stop button as rapidly as possible, and the measured reaction time is recorded in the ship's log. The space travelers tested their reaction in this fashion 10 times in a row.

In the second part, the cosmonauts have to estimate a time of 10-second duration. Here also the deviations are recorded and evaluated later. The third partial test involves the comparison of two time spans. The test conductor initially lights the red-light-emitting diode for 9 seconds. Subsequently, the diode again emits light for several seconds, and the test subject has to indicate whether the second period was longer or shorter than the first.



Space Version of the Hand-held Electronic Stopwatch Developed at Ruhla for the "Time" Experiment. On the left is the mass-produced version used for sports events and industrial applications. The effect of space factors on the cosmonauts' ability to react is studied as part of this experiment on board Salyut 6.



LtCol/Dr Werner Pröhl, the leader of the "audio" experiment, is shown at work with the "Elbe" device in the institute for aero medicine at Königsbrück.

This experiment, as explained by its scientific leader, Dr. Max Handt, is part of extensive work at the institute for aero medicine to determine the limits of rapid and correct reaction in a scientifically exact fashion. These questions are of great significance to engineering psychology for the shaping of work places and work processes, because they have to be adapted in an optimum fashion to the psychic and physical conditions of man.

In the "taste" experiment, the intercosmonauts continued experiments to determine changes in taste experienced under the influence of space factors. For this they use a taste meter developed by Polish scientists and which was used for the first time by the crew of Soyuz 30.

Ability to relax and recuperate was studied by the cosmonauts in a sixth medical experiment, designated "leisure time." For this, among others, several television entertainment programs were played onboard Salyut 6, and their effect on the test personnel was determined.

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ANNUAL GENERAL ASSEMBLY OF THE BSSR ACADEMY OF SCIENCES

Minsk IZVESTIYA AKADEMII NAUK BSSR: SERIYA FIZIKO-ENERGETICHESKIKH NAUK in Belorussian No 3, 1978 pp 130-134

[Article by I. U. Sakevich]

[Text] The Annual General Assembly of the BSSR Academy of Sciences was held on 28 March 1978 to discuss the results of the work of the Academy in 1977. The opening address was given by the Academy's president, Academician M. A. Barysevich. He stated that the year 1977 passed under the banner of the 60th Anniversary of the Great October Socialist Revolution and the adoption of the the new USSR Constitution. The Academy's collective achieved new successes in the jubilee year. The Order of Labor Red Banner Institute of Physics was a winner in All-Union Socialist Competition among academic scientific-research institutions, being awarded the challenge Red Banner of the CC CPSU, the USSR Council of Ministers, the AUCCTU, and the CC Komsomol. For high creative indicators in honor of the 60th Anniversary of Great October, that institute and the Order of Labor Red Banner Institute of Heat and Mass Exchange imeni A. V. Lykaw were awarded Honor Certificates of the BSSR Supreme Soviet, and the Institute of Mechanics of Metal-Polymer Systems received the Honor Certificate of the BSSR Trade Unions Council. For high results in completing the scientific-research plan for 1977, the Institute of General and Inorganic Chemistry received the challenge Red Banner of the Minskaya Oblast Belorussian CP Committee, the Minsk City Executive Committee, and the Minskaya Oblast Trade Unions Council.

President M. A. Barysevich went on to discuss the most important results of fundamental and applied research achieved in the report year. He noted that the Institute of Mathematics had resolved the problem of weak approximation in algebraic groups over random fields, established stability of a new type in K-theory, found the necessary and sufficient conditions of the finiteness of the number of classes of conjoined maximum metabel [unidentified] subgroups of the full linear group, and studied the analytic structure of the sections of autonomous and periodic differential systems on integral heterogeneities.

Members of the Institute of Physics worked out supersensitive phase-polarization methods of analysis, developed a theory and achieved generation of reversible Gaussian light beams, and developed new types of thin-filmed lasers. The Institute of Solid Physics and Semiconductors produced

compound blocks which can be soldered and welded; they are made up of a layer of metal and superhard material based on cubic boron nitride. The Institute of Eletronics developed an automated optical-electronic information input-output system for holographic memory devices.

Members of the Institute of Heat and Mass Exchange studied the kinetics of mass exchange for various regimes of rarefaction of gas flows in the presence of physical-chemical transformations at interfaces, and they formulated and achieved asymptotic solutions to a number of tasks of the Stefan type in porous bodies with regard to the kinetics of mass exchange.

The Institute of Cybernetics Engineering developed a simulation model of the functioning of the computer complex of a shared-use system of planning automation.

The Physics Engineering Institute worked out elements of a theory of the impact of a solid on an enclosed liquid body located in a chamber with a deformed base. These studies make it possible to model and calculate the technological processes of hydraulic impact stamping.

Members of the Institute of Mechanics of Metal-Polymer Systems proved that a change in molecular structure which enriches the spectral composition of the fluctuating electromagnetic field of the polymer is accompanied by a change in the adhesion interaction in the contact zone.

The Institute of Problems of Machinery Reliability and Durability formulated a unified approach to evaluating the reliability of transport and traction machinery. A number of new instruments for continuous quality control of welded joints, determination of the thickness of galvanized coatings on nonmagnetic bases, and research into the kinetics of the transformation of austenite in steel were developed and adopted by the Division of Physics of Continuous Control.

The Institute of Physics and Organic Chemistry worked out an effective method of synthesizing organic amines. A new additive to crankcase oil was developed in the Institute of General and Inorganic Chemistry. Members of the Institute of Bio-Organic Chemistry determined the primary structure of adrenodaxine, a protein which plays a vital role in an organism's oxidation process. Initial data for formulating technical-economic substantiation of integrated waste-free peat processing were obtained in the Peat Institute. The Institute of Geochemistry and Geophysics drew up a series of lithological-facial charts of the Pripyat' Depression.

A number of interesting results were achieved in the year by the Academy's biologists. In particular, physiologists detected age changes in chemical structures of prevertebral vegetative ganglia and their reflector reactions. Geneticists worked out a mathematic model to analyze the interaction between components of combinability and the medium in order to study the effects of heterosis in a strain of corn under Belorussian and Czechoslovak conditions.

Members of the Institute of Experimental Botany imeni V. F. Kuprevich drew up a Belorussia SSR vegetation map for broad scientific and practical purposes. They studied the distribution and infestation of mixed potato rot and made recommendations for controlling it.

The Institute of Photobiology continued to develop the concept of the structural-functional organization of the system of centers of biosynthesis of chlorophyll in plants, and found that the functioning of the cell's genetic apparatus may be governed by cooperative structural restructuring of the membrane.

Members of the Central Botanical Garden summarized the findings of many years of research in the introduction of cranberries and worked out recommendations on raising them in Belorussia and the question of designing an experimental plantation.

Zoologists determined the role of migratory birds in the transfer of ectoparasites and agents transmitting virus infections; they worked out recommendations for assessing the influence of bird migration on epidemiological phenomena. Microbiologists determined the principal ways of controlling the biosynthesis of the enzyme complex.

Substantial results were achieved by the social scientists. The Academy's philosophers and legal experts examined the rising role of the individual and the creative collective under developed socialism and the ongoing scientific-technical revolution; they examined the characteristic processes of internationalization at the present stage, and demonstrated the stimulating function of legal sanctions in the fulfillment of economic obligations by socialist enterprises. Economists completed a complex of studies designed to improve the methodology and procedures of assessing the effectiveness of social production at the regional level, and worked out recommendations for practical assessment of the influence of material-consumption, labor-intensiveness, and capital-intensiveness on the effectiveness of social production. Members of the Institute of Art, Ethnography, and Folklore did work on damage to monuments in Gomel'skaya and Grodnenskaya oblasts and prepared two volumes on "The History of Belorussian Decorative Art." Linguists proposed a new approach to the problem of segmenting the speech flow. Literary specialists compiled a metrical guide to the poetry of Maksim Bagdanovich and a bibliography of works on poetry criticism.

Academician M. A. Barysevich reported that Academy members in 1977 published 103 monographs and almost 3,500 scholarly articles. They received 709 certificates of invention and 102 diplomas and 114 medals of the USSR and BSSR VDNKh [Exhibition of Achievements of the National Economy] and international expositions. Some 254 applications were adopted in the national economy, yielding an economic effect of 39.1 million rubles. Although these are good results, M.A. Barysevich noted, this year they will have to be improved, because 1978 is a jubilee year for the Belorussian SSR and the Belorussian CP. The first of January marks 50 years since the founding of the Belorussian Academy of Sciences.

Then Academy President M. A. Barysevich turned the speaker's stand over to Head Academic Secretary of the BSSR Academy of Sciences Presidium, Academician A. S. Dzmitryyew, for a report on the scientific-organizational activities of the Academy in 1977, which are focussing attention on problems of further improving the effectiveness of work in scientific administration, perfecting planning and coordination of research and raising its level, organizing integrated research in collaboration with the VUZ's and sector scientific-research institutes, and better introduction of research accomplishments in the national economy; he also discussed shortcomings and unresolved problems which crucially affect the successful accomplishment of the tasks set forth at the 25th CPSU Congress with regard to further improving the effectiveness and quality of scientific research.

In 1977, units of the BSSR Academy of Sciences and the VUZ's administered by it, as well as Belorussian scientific organizations, continued research along scholarly lines that have developed in recent years in response to tendencies of growth of the republic's science and economy.

Academician A. S. Dzmitryyew remarked that in accordance with decisions of the Third Plenum of the CC CPB and for purposes of concentrating manpower and resources on the most urgent directions for raising the integration and level of research and involving VUZ's and sector scientific-research institutes more deeply in handling of fundamental problems, the Academy Presidium adopted a new procedure of formulating plans of scientific-research work in the domain of the natural and social sciences in the BSSR, based on the program-goal method. On recommendation of the departments and the Council for Coordination of Scientific Activities of the BSSR Academy of Sciences, the Presidium approved integrated programs dealing with 20 important problems in the field of natural and social sciences, problems of which are dealt with in a special section of the plan of scientific-research work in the BSSR for 1978.

In 1978, earmarked financing of the most important fundamental and applied projects was used for the first time in assigning the year's targets to the Academy's institutes. For more effective coordination of fundamental research in the republic, managers and supervisors were designated to deal with the most important problems, also head organizations, and the make-up and structure of all scientific councils were designated in accordance with the list of scientific directions in the natural and social sciences coordinated by the Academy of Sciences as approved in 1976.

Speaking of the work of the scientific councils, he noted that their performance in the year had been very fruitful. For example, the "Development and Use of Polymer and Metal-Polymer Materials in the National Economy" council, headed by BSSR Academy of Sciences Academician U. A. Bely, recommended a number of structural materials, developed on the basis of secondary raw materials from Belorussian enterprises, for the production of items used in aggressive and abrasive media. Thanks to the active leadership of the council headed by Academy corresponding member L. L. Suschenya, research in the field of rational utilization, reproduction,

and protection of the resources of the republic's biosphere has been expanded considerably. On the basis of materials prepared by the scientific council dealing with problems of Poles'ye, headed by Academy corresponding member S. Kh. Budyk, also by divisions of chemical and geological sciences, biological sciences, and social sciences, measures were worked out in the Academy on utilization of a plan of land reclamation for the 10th Five-Year Plan. Also worthy of special praise is the activity of other scientific councils headed by BSSR Academy of Sciences academicians B. B. Boyka, B. I. Stsyapanaw, F. S. Martsinkevich, I. D. Yurkevich, I. A. Bulygin, V. P. Sevyardzenka, and M. V. Biryla, and corresponding members L. I. Kisyalewski, U. A. Pilipovich, L. U. Khatylyova, V. B. Nestsyarenka, I. Ya. Navumenka, P. Ts. Petrykaw, U. I. Nyafyod, U. S. Kamarow, and others.

Then Academician A. S. Dzmitryyew discussed problems of organizing the effective utilization of scientific applications in the national economy. He pointed out that in the last five to seven years the Academy's scientists achieved a substantial rise in the economic effectiveness of their findings, thanks chiefly to substantially increasing the volume of economic-contract work and, on this basis, expanding ties with enterprises in the national economy. This is illustrated by the following figures: in the Eighth Five-Year Plan, the annual volume of such work averaged 4.8 million rubles; in the Ninth--12.4; in the first year of the Tenth--20.6; in the second year--25 million. There was a corresponding rise in the economic effect due to the direct adoption of scientific applications in production.

These achievements became possible because the Academy sought out more effective ways to implement the findings of fundamental and applied research in practice, to utilize new forms of linking science with production. These included organizing meetings between Academy scientists and managers of ministries, departments, and major enterprises in the republic, the implementation of joint projects with ministry organizations on the basis of long-term, program-oriented agreements, also integrated programs with major industrial associations, and so on. In 1977, Academician A. S. Dzmitryyew emphasized, Academy institutions offered major applications for adoption. But it is essential to take appropriate steps to disseminate the findings of scientific-research work among sectors of the national economy.

Academician A. S. Dzmitryyew remarked that in 1977 the USSR Council of Ministers State Committee for Inventions and Discoveries registered the discovery by Academician M. A. Barysevich and Doctor of Physical-Mathematical Sciences B. S. Neparent of "The Phenomenon of Stabilization and Labilization of Compound Electronically Excited Molecules." Sectors of our national economy utilized 154 inventions, with a total economic effect of 12.5 million rubles.

Academician A. S. Dzmitryyew went on to state that in the year there was further development of scientific ties between the BSSR Academy of Sciences

and institutions of the academies of the union republics. An agreement was signed in Dushanbe on creative collaboration between the BSSR and the Tadzhik academies in the domain of spectroscopy and physical-chemistry of cotton and cellulose fibers, liquid crystals, refined petroleum products, and the use of microorganisms in various technological processes. A joint research agreement was concluded with institutions of the Kirgiz Academy of Sciences in the field of physics, computer software; and with the Latvian Academy on long-term scientific-technical collaboration in the field of automating scientific research. Joint work continued with institutes of the Ukrainian and Moldavian academies of sciences with regard to eight regional problems. Collaboration on the basis of an agreement on socialist competition between the Belorussian Academy and the Lithuanian Academy almost doubled.

During the year the Belorussian Academy of Sciences was visited by USSR Academy of Sciences President Academician A. P. Aleksandrov. He got acquainted with the work of a number of institutions and the results of their work on adopting scientific applications in practice, and made some important recommendations.

In implementing the tasks formulated by the 25th CPSU Congress, the Belorussian Academy of Sciences has done considerable work to improve the organization of international scientific relations, to raise their effectiveness. At present, 14 of the Academy's institutions are collaborating on 28 problems and special themes with 39 scientific-research centers of the CEMA countries, also the United States, France, Great Britain, Sweden and Indian. Exhibition activities were especially significant during the jubilee year. Academy institutions displayed their work at 23 exhibitions. The most important were the jubilee exhibitions dedicated to the 60th Anniversary of the Great October Socialist Revolution held in the USSR and BSSR VDNKh's and in Warsaw, the international exposition Chemistry-77, the All-Union Exhibition "Inventions and Rationalizations-77," and others. The best work of the Academy's workers received exhibition medals and certificates.

Academician A. S. Dzmitryyew focussed special attention on the cadre question. He noted that as of 1 January 1978 the Academy included 58 academicians, and 77 corresponding members. The scientific staff included 188 doctors and 1,462 candidates of sciences. For his great contribution toward scientific development and collaboration with the science centers of Czechoslovakia, BSSR Academu of Sciences President M. A. Barysevich was elected as a foreign member of the Czechoslovak Academy of Sciences. Then A. S. Dzmitryyew discussed problems of the Academy's graduate studies program and the training of groups of research students in the Academy's institutions within the system of the Moscow Institute of Physics Engineering. In particular, he stated that during the year an agreement was concluded on training students for research work between the Belorussian Academy's Institute of Physics and Gomel' University.

In conclusion, A. S. Dzmitryyew discussed questions of the financing and material-technical suppory of scientific research, capital construction of science facilities; he described the activities of the construction organizations, mentioned the difficulties and oversights involved in these problems, and expressed confidence that the Academy's collective would successfully complete the targets of the third year of the Tenth Five-Year Plan.

Next to take the stand after the report given by the Head Academic Secretary of the Belorussian Academy of Sciences Presidium came Academician R. G. Garetski, director of the Institute of Geochemistry and Geophysics; corresponding member M. R. Sudnik, director of the Institute of Linguistics imeni Ya. Kolas; Academician B. I. Stsyapanaw, director of the Order of Labor Red Banner Institute of Physics; Academician R. I. Salaukhin, director of the Order of Labor Red Banner Institute of Heat and Mass Exchange imeni A. V. Lykaw; Academician M. A. Darozhkin, chairman of the BSSR Academy of Sciences Presidium Commission on the Scientific Principles of Agriculture; P. I. Svyatlow, director of the Central Design Bureau for Experimental Production of the Academy; Academician M. V. Turbin, academic secretary of the BASKhNIL [All-Union Academy of Agricultural Sciences imeni V. I. Lenin] Department; corresponding member L. M. Sushchenya, deputy academic secretary of the Academy's Department of Biological Sciences. They discussed the achievements made by the scientists in various fields and made a number of proposals on further perfecting the activities of the Academy's institutions.

In his report, Academy President M. A. Barysevich discussed problems which, in his opinion, are hindering efforts to improve effectiveness and having an adverse effect on the Academy's performance. He stated that in the plan of development of fundamental research it is essential to focus special attention on strengthening research in the field of earth sciences; it is necessary to strive for practical accomplishment of the directives of the planning of scientific research, experimental design work, and production testing. It is essential that promising applications be adopted not only in individual enterprises but also on a sectorwide scale in the national economy. The president mentioned applications which can radically alter various technological processes in the sectors. These include new methods of centrifuge drying, concrete additives which improve the quality of mechanical properties of reinforced concrete, new varieties of barley and wheat, and so on.

Academician M. A. Barysevich discussed problems of patent and license work, automation of scientific research, cadre turnover, and so on. In conclusion, M. A. Barysevich assured the CC CP Belorussia and the republic's Council of Ministers that the Academy's collective will accomplish the tasks assigned to science by the party and the government.

The General Assembly approved the report on the activities of the Belorussian Academy of Sciences in 1977 and advised the Presidium to see to it that its practical work takes account of the critical remarks and suggestions made by

conference participants. The Assembly approved new membership of the Council for Coordinating the Scientific Activities of the Belorussian Academy of Sciences, consisting of 79 persons. Council chairman is Academy President M. A. Barysevich, first deputy chairman is corresponding member V. P. Grybkowski, academic secretary of the Council is Candidate of Philological Sciences V. I. Darashkevich.

At the evening session, ceremonies were held to award the challenge red banners and honor certificates to collectives of institutions and organizations of the Academy who were winners in socialist competition for 1977.

At the end of the evening session there were scientific papers given by Academician P. I. Al'smik, "Problems of Selection of Potato Varieties," and corresponding member L. I. Kisyalewski, "Plasma Physics." Both papers were listened to attentively.

The work of the Annual Assembly was participated in by CC CPSU Politburo candidate-member, CC CP Belorussia First Secretary, and BSSR Council of Ministers Chairman Ts. Ya. Kisyalyow, CC CP Belorussian Secretary A. T. Kuz'min, Belorussian SSR Council of Ministers Deputy Chairman I. M. Glazkow, CC CP Belorussia Division of Science and VUZ Director Yu. P. Smirnow, and others.

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FIFTH ALL-UNION CONGRESS OF SCIENTIFIC AND TECHNICAL SOCIETIES HELD IN MOSCOW

Moscow MEKHANIZATSIYA I AVTOMATIZATSIYA PROIZVODSTVA in Russian No 5, 1978 pp 58-59

[Article by Ye. T. Larina]

[Text] On 24-26 January 1978 the Fifth All-Union Congress of Scientific and Technical Societies (VSNTO] was held at the Large Kremlin Palace in Moscow, with numerous representatives of one of the largest organizations of the scientific and technical community.

Some 1,400 delegates representing 23 branch scientific and technical societies with more than 8.5 million members came from the far ends of the country to participate in the work of the congress.

For the first time, representatives of Hungary, Poland, Romania, Czechoslovakia and other foreign countries attended the congress.

As the Greeting to the congress from the CPSU Central Committee states, under conditions of developed socialism, the workers' striving for scientific and technical creativity is intensifying, the freedom of such creativity having been guaranteed by the new USSR Constitution which went into force on the eve of the 60th Anniversary of Great October.

The activity of the scientific and technical societies facilitates successful implementation of the scientific and technical revolution, the large-scale involvement of participants in social production in that process, and enhancement of the creative cooperation of workers at mental and physical labor.

The scientific and technical societies have worked fruitfully to propagandize and introduce into production the achievements of science and engineering, progressive technology and leading experience.

Together with all the Soviet people, the scientific and technical societies have energetically taken up realization of the tasks set in the resolutions

of the December (1977) Plenum of our party's Central Committee, in the CPSU Central Committee, USSR Council of Ministers, AUCCTU and All-Union Lenin Komsomol Central Committee Letter "On Developing Socialist Competition for Fulfillment and Overfulfillment of the 1978 Plan and Intensifying the Struggle to Improve Production Efficiency and Work Quality."

The CPSU Central Committee Greeting to the Fifth VSNTO Congress directed the scientific and technical community to solve fundamental problems of the technical improvement and intensification of production, to work out and introduce highly productive means of mechanization and automation, progressive technology, and scientific organization of labor and production.

Upwards of 40 delegates -- scientists, engineers, leading production workers -- spoke at the congress.

Many scientific and technical society boards, councils and primary organizations are working actively to solve the problems of overall production mechanization and automation. Many congress delegates spoke of this in their speeches.

Opening the congress's first meeting, Academician A. Yu. Ishlinskiy (VSNTO chairman) said that the number of members had increased nearly 1.5-fold over the past five years. Every second society member is an engineer or scientist and one in every eight is a worker-innovator.

Quite a bit has been done to replace heavy physical labor with mechanized labor, to reduce losses of metal, to improve machinery reliability and durability, to improve standards, to develop safe equipment and new implements of labor, to improve materials, and to develop and introduce progressive technological processes which do not pollute the environment. Much attention has been paid by scientific and technical societies to solving problems of electric power, fuel, water and metal economy.

Branch society central boards have organized reviews of new equipment plans. The number of participating science and production workers has reached four million. About two million suggestions aimed at developing and introducing highly efficient technological processes, machinery and equipment most quickly are received from them each year.

Comrade A. Yu. Ishlinskiy's report made special note of the creative cooperation between the Novolipetskiy Metallurgical Plant and the Uralmash production association to increase the production of metal products and to improve efficiency, which cooperation has been evaluated highly by L. I. Brezhnev.

The republic councils of societies in the Ukraine, Belorussia, Latvia, Lithuania, Moldavia and Uzbekistan have paid much attention to work on reducing manual labor. In 1975 alone, a routine review at enterprises of Lithuania resulted in the introduction of more than 900 means of mechanization, which freed 2,500 workers from heavy jobs. The mining scientific and technical

society participated in working out and introducing steps permitting the freeing at mines of 22 production associations of the Ministry of Coal Industry of about 2,000 workers employed at heavy manual labor for other work.

Academician A. Yu. Ishlinskiy emphasized the urgency of problems of mechanizing manual labor in transport and warehousing, of mechanizing the unloading of frozen freight, the loading and unloading of open rail cars, of cleaning up bulk freight. Consideration should be given to the fact that the primary direction of mechanizing production processes, as defined by the 25th CPSU Congress, is the changeover from creating individual machines and series of machines to the creation of systems of machines, machinery, transport facilities and equipment with remote control, and the subsequent transition to computer control. The increasingly close cooperation between Soviet scientific and technical societies with the societies of the fraternal socialist countries was noted. Working groups have been created for the joint development of recommendations on technical problems included in the CEMA Comprehensive Program, and in particular, on problems involving the standardization of machine-building items.

V. A. Masol, Chairman of the Ukrainian republic Scientific and Technical Society Council and First Deputy Chairman of the Ukrainian SSR Gosplan, told how problems of mechanizing auxiliary production are being solved in the republic. At the Serp i Molot Motor-Building Plant in Khar'kov, steps whose implementation has permitted raising the level of loading-unloading and warehousing mechanization to 89 percent, that is, to the basic production level, have been developed with the active assistance of the plant scientific and technical society's council; upwards of 300 workers were freed for other tasks and more than 700,000 rubles in annual savings was obtained.

The number of workers employed at manual labor is being reduced by approximately one million in the Ukraine during the Tenth Five-Year Plan as a result of the implementation of production mechanization and automation measures, including a reduction of 300,000 in industry.

Doctor of Economic Sciences A. A. Golikov, Chairman of the Chelyabinskaya Oblast Scientific and Technical Society Council, reported that 10,300 persons in oblast industry were freed from manual jobs in 1976 and 1977.

The fact that solution of mechanization and automation problems in various branches of the national economy is seen by machine builders to lie foremost in the creation of new machines was discussed by V. S. Vasil'yev, Chairman of the Central Board of the Machine-Building Industry Scientific and Technical Society.

The machining and assembly of parts require large expenditures of labor. In large-series and mass machine-building production, assembly labor intensiveness reaches 35 percent, and in unit and small-series production -- up to 40 percent of the total labor intensiveness of manufacturing the articles. At the same time, it is these very assembly jobs, in which labor remains strained

and monotonous, that still remain poorly mechanized. A special section in which production scientists and specialists participate has been created under the central board. Recommendations on improving technology and the mechanization and automation of assembly work in machine building have been worked out and introduced. In 1977, the scientific and technical society's central board, jointly with a number of ministries, held an All-Union contest for the best work on improving the technology, mechanization and automation of machine-building assembly. More than 400 assembly specialists and worker-innovators participated in it. The economic impact from introducing the work noted in the contest has been 6.7 million rubles.

MEKHANIZATSIYA I AVTOMATIZATSIYA PROIZVODSTVA has introduced a special section, "Assembly Mechanization," to disseminate the positive experience and generalize what is advanced in the area of assembly based on central board recommendations.

In conclusion, V. S. Vasil'yev focused attention on the pressing necessity of mechanizing and automating the labor of engineering-technical workers, designers and technologists.

G. F. Pronin, Chairman of the Paper and Wood Processing Industry Scientific and Technical Society, reported that a savings of more than 35 million rubles has been realized from the realization of labor-intensive processes in the branch over the past two years.

A. Kh. Komashenko, Director of the All-Union Scientific-Research and Planning-Design Institute of Lift-Transport Machine Building, Loading-Unloading and Warehousing Equipment and Containers, stressed in his speech that production mechanization and automation, and foremost the mechanization and automation of loading-unloading, lift-transport and warehousing jobs, is not just an economic task, but a social one as well. In order to create and master the production of new automated types of equipment, we need the efforts not only of specialists in one field, but also of a number of related production fields.

Doctor of Economic Sciences R. L. Rayatskas, Chairman of the Lithuanian republic Scientific and Technical Society Council, spoke about the work and tasks facing the Lithuanian Scientific and Technical Society.

Comrade L. I. Brezhnev emphasized at the 25th CPSU Congress that a sharp reduction in the proportion of manual labor and overall mechanization and automation are essential conditions of economic growth.

In recent years, about 8,000 workers have been freed from heavy labor in the republic. However, nearly a third of the industrial workers are employed at manual labor. The level of mechanization of the labor of auxiliary workers is low. Thus, much work lies ahead.

The experience of scientific and technical society efforts to organize the interbranch "Small-Scale Mechanization-75" exhibit in Vil'nyus in 1975 is of interest.

V. V. Boytsov, Chairman of the USSR Council of Ministers' State Standards Committee, said the most important scientific-technical and economic tasks connected with developing the fuel-energy base and with further improving the technical level and reliability of machinery, equipment and apparatus, with saving metal, materials and labor resources are those outlined by the December (1977) CPSU Central Committee Plenum.

Maximum research on standardization possibilities is directly related to the resolution of these tasks. Some 130 comprehensive standardization programs which coordinate requirements as to finished products, raw and other materials, technological processes, equipment, and so forth, have been developed and approved.

A. I. Shibayev, Chairman of the AUCCTU, stressed that the scientific and technical community of our country has been given the right to participate in developing new equipment. Comrade Shibayev called for fuller use of that right, so as to achieve the inclusion of efficient scientific and technical developments on mechanizing and automating production processes, especially in auxiliary production areas, and making working conditions easier and healthier. It is necessary to introduce more persistently the experience of the scientific and technical communities of Chelyabinskaya, Zaporozhskaya and Kuybyshevskaya oblasts, Latvia and Lithuania on mechanizing manual labor. Delegates spoke of this experience at the congress.

The new USSR Constitution guarantees freedom of scientific and technical creativity, and the state assumes the responsibility for creating the conditions necessary for this, mobilizing the efforts of scientists, engineers, technicians, and worker-innovators for accelerating in all ways possible the introduction and use in the national economy of scientific research results, and strengthening the creative cooperation of science and production.

It is very important, A. I. Shibayev said, that the scientific and technical community of many republics, krays and oblasts pay more attention to implementing the tasks of overall mechanization and automation of production processes, to reducing manual labor.

G. P. Sofonov, Chairman of the Central Council of the VSNTO of Inventors and Efficiency Specialists, reported in his speech that the savings obtained in the national economy during the Ninth Five-Year Plan from using inventions and efficiency proposals was 19.6 billion rubles; during the first two years of the current five-year plan, it reached 10 billion rubles.

The Fifth VSNTO Congress resolved that the activity of the societies must be aimed at participating in actualizing the basic tasks on developing the national economy, and in industry in particular. Their work must facilitate better satisfaction of the requirements of the national economy and the population for high-quality output, the retooling and intensification of production in all branches, and further development of machine building, which plays a top-priority role in raising the technical level and improving the qualitative indicators of all branches of material production.

This precise program of basic scientific and technical society activity was warmly supported by the congress delegates.

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